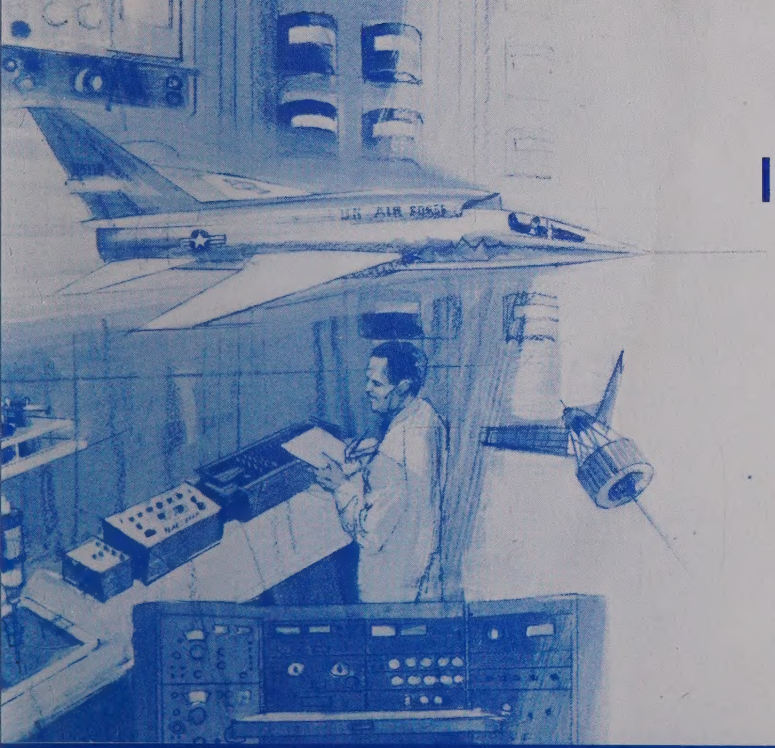


INSTRUCTION MANUAL

AC/DC SINGLE-PHASE ELECTRODYNAMOMETER WATTMETERS MODELS DW, DLW, and UNIVERSITY

THE SINGER COMPANY • METRICS DIVISION

Panoramic · Sensitive Research · EMPIRE · Gertsch

WARRANTY

THE SINGER COMPANY, METRICS DIVISION, warrants each new instrument to be free from defects in material and workmanship, effective after delivery to the original purchaser as follows:

*Sensitive Research** Electrical Indicating Instruments.....2 years
Other Electrical and Electronic Measuring Instruments.....1 year

Repair or replacement (at our option) without charge (F.O.B. factory) will be effected when our examination satisfactorily indicates that defects are due to workmanship or materials. Electron tubes, semiconductors, batteries, fuses, lamps, thermoelements, and *RatioTran** potentiometers are excluded from warranty coverage. Warranty returns must first be authorized by the factory.

If the instrument or any portion thereof, has been abused, misused, damaged by accident or negligence, or if any serial number or seal has been removed or altered, the warranty is void.

This warranty is in lieu of all other obligations or liabilities expressed or implied and The Singer Company neither assumes, nor authorizes any person to assume for them, any other liability in connection with sales of instruments manufactured by The Singer Company, Metrics Division.

THE SINGER COMPANY • METRICS DIVISION
915 PEMBROKE STREET, BRIDGEPORT, CONNECTICUT • 3211 S. LA CIENEGA BLVD., LOS ANGELES, CALIFORNIA

*A Trademark of THE SINGER COMPANY

SENSITIVE RESEARCH* MODELS DW, DLW AND UNIVERSITY WATTMETERS

GENERAL DESCRIPTION

The SENSITIVE RESEARCH* Models DW, DLW and University Wattmeters are single-phase AC/DC, magnetically-shielded electrodynamometers used as either calibration standards or general purpose testing instruments. The wattmeters are laboratory standardized with direct current and voltage, taking the mean value of reversed currents through the instrument, at an ambient temperature of 25°C (77°F). Meter indications are based on the Absolute Volt and Ampere.

SPECIFICATIONS

The following table lists the electrical specifications of the Models DW, DLW and University Wattmeters.

SPECIFICATIONS

	DW	DLW	UNIVERSITY	UNIVERSITY
Accuracy:	0.25%	0.5%	0.5%	0.75%
Power Factor:	50% to 100%	20% to 100%	50% to 100%	20% to 100%
Frequency:	DC and 25 to 800 Hz	DC and 25 to 500 Hz	DC and 25 to 800 Hz	DC and 25 to 500 Hz

* A trademark of THE SINGER COMPANY

OPERATION

The instruments are shielded from the effects of external magnetic fields up to 5 oersteds by means of a special magnetic shield. When using the instruments on direct current, the mean value of reversed currents through the instrument should be taken to obtain the greatest accuracy. This procedure eliminates the effect of any slight residual magnetism in the shield which may have been produced by exposure to strong magnetic fields.

Temperature corrections are minimized by special design of the instruments. The factor by which the indicated Watts reading must be multiplied to obtain the actual Watts readings is given on the instrument data card or certificate. A zero adjuster is provided to set the pointer on zero when no connection is made to the instrument. If the pointer is off zero, it should not be reset until the scale glass has been discharged of all static by breathing upon it. If a zero correction of more than 5 percent full scale is necessary, set the pointer to zero and then check the meter balance. An abnormal zero shift may be due to a bent pointer. In general, the instruments have two current and two or three potential ranges which are self-contained. The current ranges are changed by means of links which connect the two sections of the field coil in series or in parallel. The potential ranges are changed by switch or by connection to individual binding posts in edgewise models. Connect the current and potential binding posts in the circuit so that an up-scale indication is obtained on the instrument.

When the instrument has a current range of 5 amperes, it can be used with current transformers to extend its range. Potential ranges can be extended by potential transformers or multipliers.

The potential circuit has an overload capacity of 60 percent; the overload capacity of the current circuit is from 100 to 500 percent. The current overload capacity is engraved on each particular instrument.

The resistance of the current and potential circuits is printed on each instrument scale. These values will be found useful when allowing for instrument losses.

In order to use the instrument in a three-phase, three-wire balanced load (phase and amplitude), an external Y-Box is required. The Y-Box, which consists of a pair of resistors accurately matched to each other and to the total resistance of the instrument potential circuit, must be used with the instrument for which it is adjusted. When the Y-Box is used with the instument, multiply the instrument indication by 3 to obtain the total power in the balanced three-phase load.

CIRCUIT CONNECTION

Figures 1 through 10 illustrate the correct manner of connecting the single-phase wattmeter to circuits normally monitored by the instrument. Generally, connect the current coils in series with the load and the potential circuit across the load. Always connect the ± binding post of the potential circuit to the side of the circuit in which the wattmeter current coil is connected. Connecting the instrument in this manner prevents electrostatic attraction between the current and potential coils, thereby avoiding erroneous instrument indications.

To extend the voltage range of the instrument, connect the instrument to a multiplier that has been adjusted for use with the particular instrument. One of the multiplier posts is marked with the range of the instrument post to which it is connected, and the other is marked with the extended range. Never connect the multiplier to the ± binding post of the instrument, as such a connection places a high voltage between

the current and potential coils, introducing errors and placing an unnecessary stress upon the insulation.

An alternate method of connecting the instrument to the circuit is illustrated in figure 11. Using this connection method places the wattmeter potential circuit on the source side of the current coil. The instrument indication then includes the power losses in auxiliary components (fuses, switches, etc.) and the current or field coils of the instrument. Several disadvantages are encountered when using this method of instrument connection. One disadvantage is that it is often difficult and impractical to allow for power losses when using current transformers with the instrument. Another disadvantage is that, in all cases, the losses vary with current and temperature changes. Under these conditions, the correction factor to use with the instrument is usually difficult to obtain. When the power loss is only within the wattmeter current circuit, it may be neglected, unless a low range wattmeter is being used.

When the alternate method of connecting the instrument is used, correct the wattmeter indication by switching the potential circuit connection from A to B as indicated in figure 11; then subtract this reading from the load reading.

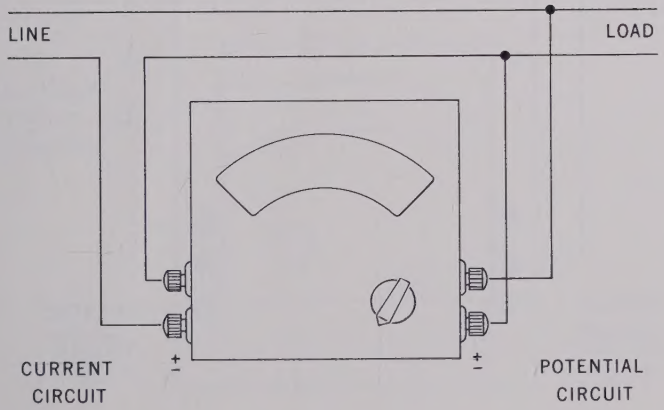


Figure 1. Wattmeter Connected Directly to Load for Measuring DC and Single-Phase AC Power

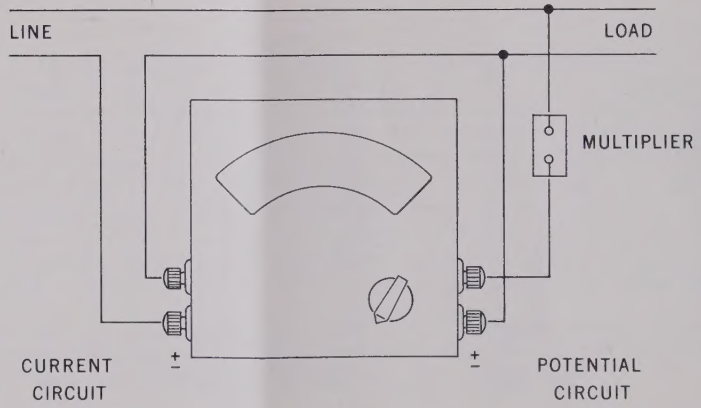


Figure 2. Wattmeter Connected through a Multiplier for Measuring DC and Single-Phase AC Power

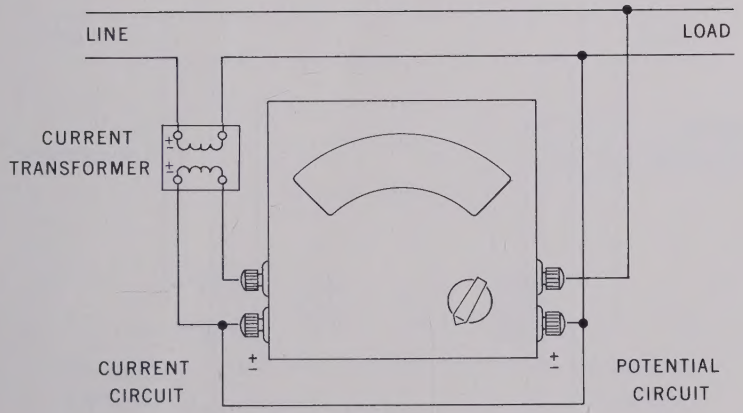


Figure 3. Wattmeter Connected to Load through a Current Transformer for Measuring Single-Phase AC Power

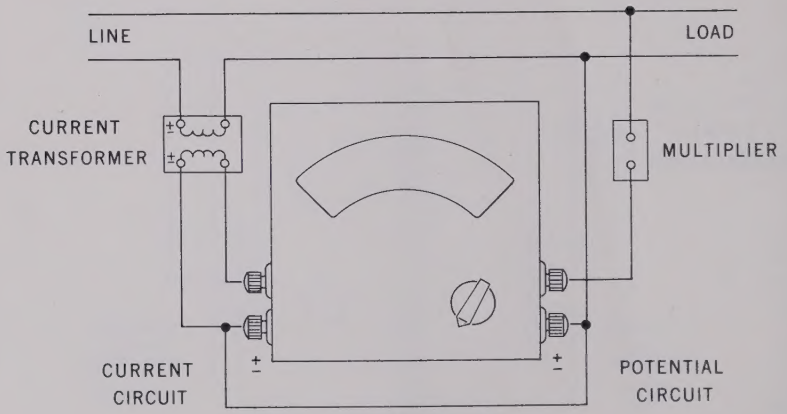


Figure 4. Wattmeter Connected to Load through a Current Transformer and Multiplier for Measuring Single-Phase AC Power

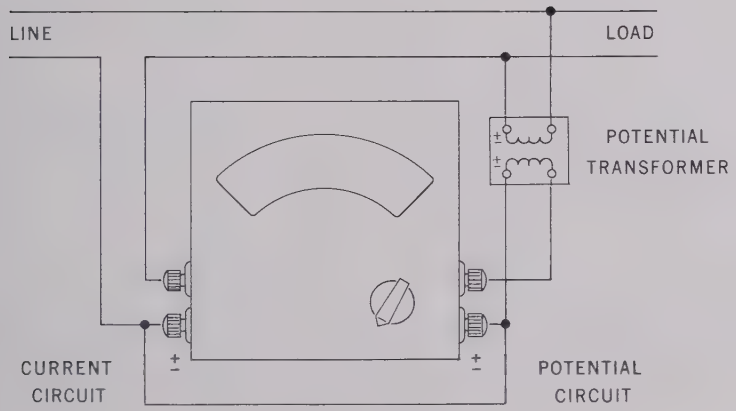


Figure 5. Wattmeter Connected to Load through a Potential Transformer for Measuring Single-Phase AC Power

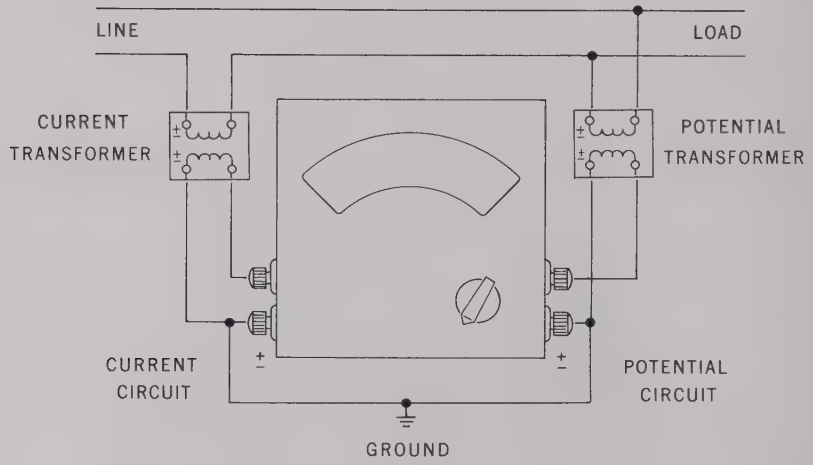


Figure 6. Wattmeter Connected to Load through Current and Potential Transformers for Measuring Single-Phase AC Power

NOTE — If an up-scale deflection is obtained on both wattmeters, when connected as shown, the true power is the sum of the two readings. If one instrument deflects negatively (power factor is below 50%), reverse its current leads and subtract the resulting positive indication from that of the other instrument to obtain the true power.

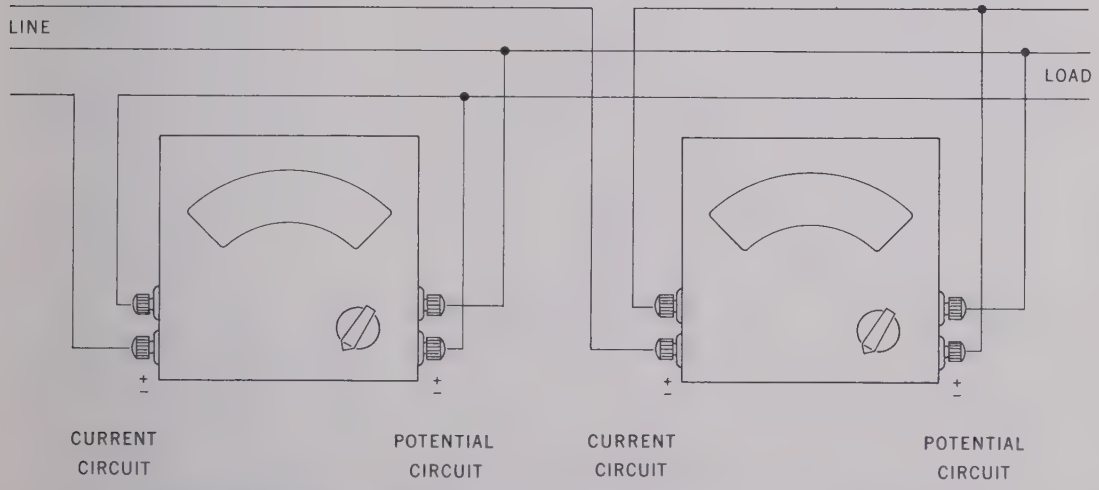


Figure 7. Wattmeter Connected Directly to Load for Measuring DC and Single-, Two-, and Three-Phase, Three-Wire AC Circuits Power

NOTE — If an up-scale deflection is obtained on both wattmeters, when connected as shown, the true power is the sum of the two readings. If one instrument deflects negatively (power factor is below 50%), reverse its current leads and subtract the resulting positive indication from that of the other instrument to obtain the true power.

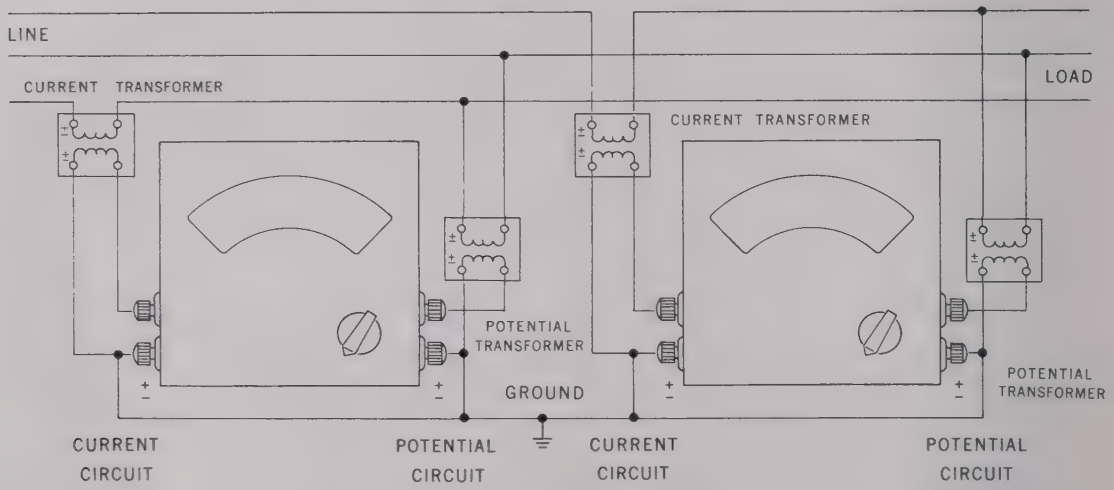


Figure 8. Wattmeters Connected to Load through Current and Potential Transformers for Measuring Single-, Two-, and Three-Phase, Three-Wire AC Circuits Power

NOTE

Multiply instrument reading by 3 to obtain correct power indication.

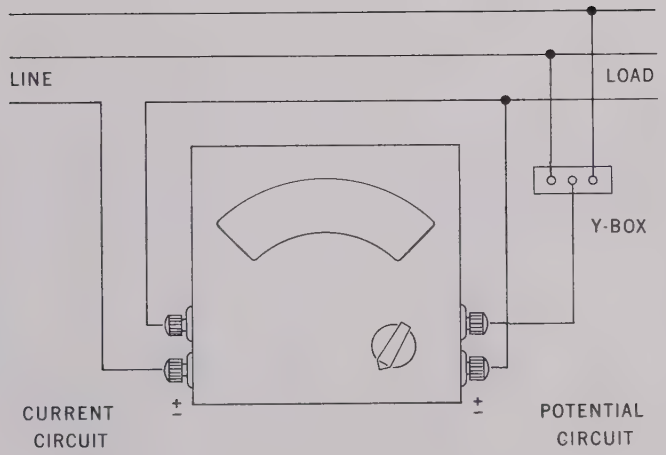


Figure 9. Connections for Measuring Three-Phase, Three-Wire AC Power in a Balanced Load, Using a Y-Box

NOTE
Apply Both Multiplying Factor of Y-Box and Current Transformer to Instrument Reading to Obtain Correct Power Indication.

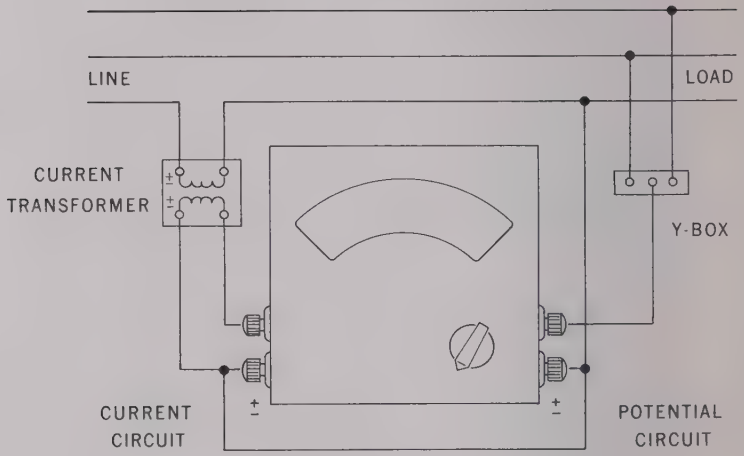


Figure 10. Connections for Measuring Three-Phase, Three-Wire AC Power in a Balanced Load, Using a Y-Box and Current Transformer

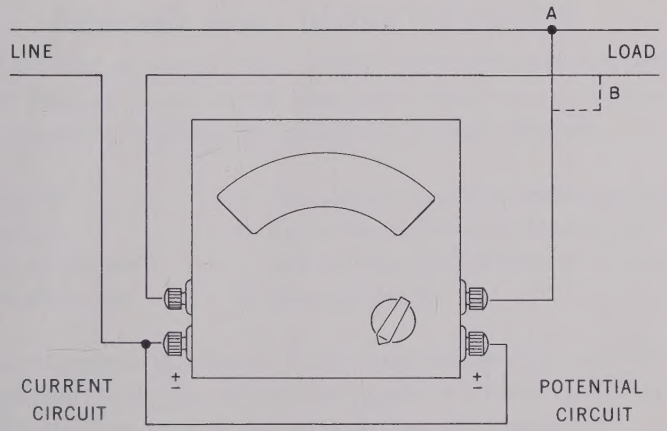


Figure 11. Alternate Method of Connecting Wattmeter for Measuring DC and Single-Phase AC Power (Current Circuit Losses Included in Instrument Reading)

REPAIR AND MAINTENANCE

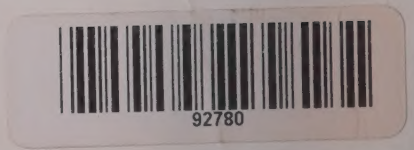
Instruments should be returned only on prior written authorization from the Singer Representative or the factory[1]. Warranty repair will be made upon written request. Please provide the following information in order to expedite our processing of your instrument:

1. Model or Type
2. Serial Number
3. Description of trouble[2]
4. Test instruments used
5. Approximate date instrument was placed in operation
6. Approximate number of hours of use
7. Has maintenance action been previously requested?
8. Other comments

Upon receipt of this information our Service Department will send you service data or shipping instructions. Upon receipt of shipping instructions forward the instrument to the factory prepaid. If requested, an estimate of charges will be made before work begins.

(1) Contact Metrics Division, Bridgeport, Connecticut for *Commander**, *Empire**, *Panoramic**, and *Sensitive Research** instruments. Contact Metrics Division, Los Angeles, California for *Gertsch** instruments.

(2) Include data on symptoms, measurements taken, suspected location of trouble, maintenance action taken, and any other relevant data.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